Search for Effective Fatigue Management Strategies for Late Night Interfacility Ambulance Transfers

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Certification Statement

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Abstract

Ambulance organizations performing late-night, interfacility transfers are placing their personnel at risk for both vehicular accidents and patient care errors due to sleep deprivation and fatigue. The problem is a reported but unverified perception by Fort Mojave Mesa Fire Department emergency response personnel of increased risk to staff and patients when interfacility transfers are performed late at night. This perception negatively affects morale and consumes energy better expended on other tasks. The purpose of this research is to verify the perception of personnel regarding the inherent risk of performing late-night, interfacility ambulance transfers and to seek out methods used by other agencies to address these risks.

Descriptive research was used to answer the following questions: (a) would a reasonable person consider the risk acceptable; (b) what methods are emergency response personnel within the Fort Mojave Mesa currently using to mitigate the hazards of late-night interfacility ambulance transfers; (c) are there methods in place at neighboring departments that differ from those in use at Fort Mojave Mesa; (d) what methods are in place at similar agencies across the country; and (e) how do healthcare facilities perceive the risk?

The procedures used to complete this research were a literature review, face-to-face interviews, telephone interviews, and an email interview. The results of this research affirmed the perception of risk associated with late-night transfers and illustrated measures that are in place in other industries as well as burgeoning technological solutions which should be investigated further for implementation in the ambulance industry.

The recommendations of this research included education and communication with transferring facility management regarding the risk and liabilities involved, instituting trials of mitigation measures for sleep deprivation and fatigue, monitoring of the effectiveness of these

measures, and research into evolving and future technologies and recommendations related to the field of sleep deprivation.

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Introduction

The Fort Mojave Mesa Fire Department provides ambulance transfers from local hospitals to hospitals located two to four hours driving time removed from the fire district. Requests for these transfers may be received at any hour of the day or night. A reported, but unverified, perception exists among emergency response personnel that they and their patients are being placed at an increased risk when performing transfers late at night. This perception negatively affects staff morale and consumes energy better expended on other tasks to serve the district taxpayers.

The purpose of this research is to verify the perception of the department's personnel regarding the inherent risk of performing late night interfacility ambulance transfers and to seek out methods used by other agencies to address those risks. In order to accomplish this task a descriptive research method was used to answer the following questions: (a) would a reasonable person consider the risk acceptable; (b) what methods are emergency response personnel within the Fort Mojave Mesa Fire Department currently using to mitigate the hazards of late-night interfacility ambulance transfers; (c) are there methods in place at neighboring departments that differ from those in use at Fort Mojave Mesa; (d) what methods are in place at similar agencies across the country; and (e) how do healthcare facilities perceive the risk?

Background and Significance

The author began serving as the Fire Chief of Fort Mojave Mesa Fire Department in April 2011. During the first few weeks with the new department during informal meetings with personnel, one of the most often heard complaints was the unacceptable level of risk staff were being subjected to due to late-night interfacility transfers.

Fort Mojave Mesa holds a Certificate of Need from the State of Arizona to provide ambulance service within the fire district. Fort Mojave Mesa Fire District shares boundaries with Bullhead City Fire District to the north and Mohave Valley Fire District to the south. Both Bullhead City and Mohave Valley hold Certificates of Need for their prospective districts. All three agencies provide advanced life support ambulance service for both emergency calls and non-emergency interfacility transfers. Fort Mojave Mesa is the first ambulance service contacted by Valley View Medical Center which is located in the district. Likewise, Bullhead City is the first service contacted by Western Arizona Regional Medical Center which is located in Bullhead City's district. Western Arizona Regional is located approximately seven and one half miles inside Bullhead City's district from Fort Mojave Mesa. If the Certificate of Need holder for the district in which the hospital is located is unable to fulfill a request for interfacility transfer, the hospital staff will call neighboring agencies (including Golden Shores Fire Department and River Medical Ambulance (located in Laughlin, Nevada)) when Bullhead City, Fort Mojave Mesa, and Mohave Valley are all unavailable.

Due to the size of the fire departments, the population density of the areas being served, as well as the amounts of and limited ability to increase funding the departments receive from other sources (for example, property taxes, fire department assistance tax, and fees for service), all three departments rely on revenue received from ambulance billing as an integral component of their budgets. Ambulance staff are fully cross-trained as both fire suppression personnel and emergency medical services providers. Over fifty percent of Fort Mojave Mesa personnel are licensed as paramedics.

Fort Mojave Mesa operations personnel are assigned to one of three shifts. Each shift works for forty-eight hours and then is off-duty for ninety-six hours. The department's Battalion

Chiefs maintain a calendar that allows off-duty staff to sign up to be on-call for interfacility transfers. If a request is received and there are no on-call staff to perform the transfer, a text message is sent to all personnel to attempt to place off-duty staff into service. In the absence of available off-duty personnel, on-duty personnel perform the transfers. The use of on-duty staff is a regular occurrence. Assignment to an interfacility request is determined on a rotational basis. A card file system is used to keep track of staff members participation in interfacility transfers. When a transfer is conducted, the employee's card is moved to the back of the box and it is not their "turn" again until the on-duty staff with cards in front of theirs have completed a transfer and the employee's card is once again in the front of the box.

In addition to the morale issues created by the perception of unnecessary risk, there is substantial evidence to confirm that the risk does indeed exist. The department has a responsibility to emergency responders, patients, and the driving public to investigate potential means of mitigating the effects of fatigue and sleep deprivation and determine their applicability in our organization. Failure to address concerns raised by staff could result in unnecessary exposure to liability should an incident occur. The management of a McDonald's restaurant was found liable when an overworked employee fell asleep driving home and was involved in an accident (*Faverty v. McDonald's Restaurants of Oregon, Inc.*, 1995). Fort Mojave Mesa would likely be found to be similarly culpable were one of our responders to fall asleep during a transfer and injure or kill someone.

This paper is linked with two Executive Development course content items: organizational culture and change and service quality (*Executive Development*, 2011). The project supports Goal 4 of the United States Fire Administration's strategic plan: "Improve the fire and emergency services' professional status (*Strategic Plan*, n.d., p. 21)."

Literature Review

More than twenty years ago, Motohashi and Takano conducted research on the effects of workloads during 24-hour shifts on ambulance personnel in Tokyo, Japan. Their research showed that subjects working over 100 minutes between midnight and 08:00 suffered more ill effects than those who were called upon to work less than 100 minutes. They concluded that 24-hour shift work impacted the ambulance personnel more so than 8-hour shifts and that nighttime naps seemed to reduce symptoms. When their research was published in 1993, they iterated that "measures to prevent the lowering of well-being of ambulance personnel are needed" (Motohashi & Takano, 1993, p. 469).

Motohashi's previous research on alterations of circadian rhythms found evidence that individuals who found themselves suited to shift work appeared to have a tendency to remain in the field (Motohashi, 1992). This finding, however, does not address the focus of this paper and is of little assistance to personnel who are new to the field and have yet to determine the effects of shift work on their performance or quality of life. The effects on individuals' circadian rhythms cannot be measured until they are participating in shift work. No research has established testing methods for definitively establishing one's capacity to tolerate shift work. Without such a screening tool, the first indication that a worker is suffering ill effects may be a vehicle accident or a serious error in patient care. A study measuring the performance of sleep-deprived drivers demonstrated that individuals who had been awake for 17-19 consecutive hours were more impaired than individuals with a blood-alcohol content of 0.05% (Erich, 2011). It is illegal in all 50 states for those holding commercial driver licenses to operate a motor vehicle if their blood-alcohol content is 0.04% or greater.

According to the National Highway Traffic Safety Administration, those at highest risk of crashing due to sleepiness are those who are already sleep-deprived or fatigued, those driving long distances without breaks, and those driving alone. Ambulance personnel driving late-night interfacility transfers often meet all three of these criteria. These points were raised in a journal article specifically addressing drowsy driving while operating an ambulance in 2000. The author recommended that the crew stop and rest. This is certainly an option on return trips with no patient on board, but is of little help during the transport portion of the trip with a patient on board needing to reach their definitive care destination (Dernocoeur, 2000).

Research conducted by the American Automobile Association's Foundation for Traffic Safety lists the following risk factors for drowsy driving accidents: being awake for twenty-four hours or more, having six or fewer hours of sleep in a twenty-four hour period, driving between midnight and six a.m., frequent feelings of drowsiness while driving, night shifts, and multiple jobs (Nugent, 2007). While several of these risk factors mirror the National Highway Transportation Safety Administration study, multiple jobs is of particular interest when discussing ambulance personnel. Fire-based agencies and non-fire-based agencies alike commonly have employees who maintain secondary employment. It is accepted practice in many agencies for staff to leave one job, drive to another, and start another tour of duty.

Drowsy driving is also an issue in the trucking industry. Some trucking industry experts have been outspoken about the need for education, reconsidering work schedules, revisiting policies and practices, and coming up with creative solutions (Bello, 2008). Zagaroli and Taylor discuss some of the reasons why ambulance employees may be profoundly resistant to elimination of 24-hour shifts (Zagaroli & Taylor, 2003) and one survey of ambulance personnel

indicated that 40% prefer 24-hour shifts (Erich, 2011). Bello's other suggestions, however, deserve thoughtful reflection on how they could possibly be applied to the ambulance industry.

Another article specific to the emergency medical industry discusses the use of education and training, managing shifts, improving the workplace, and instituting lifestyle changes as strategies to manage fatigue. Specific guidance regarding nap duration recommends keeping the time to less than 45 minutes or at least two hours in order to avoid sleep inertia – the feeling of grogginess following an abrupt awakening (Frank, 2004). A separate study involving emergency room physicians and nurses noted markedly better scores four hours after a 40-minute nap break when compared to the control group who did not nap (Smith-Coggins et al., 2006). An extensive meta-analysis by Driskell and Mullen determined that fifteen-minute naps partially reversed the effects of sleep deprivation for nearly seven hours (Driskell & Mullen, 2005).

Sleep disorders have been found to be another factor contributing to higher risk of drowsy driving-related incidents. Sleep disorders also have health effects that impact other aspects of employees' lives. One trucking company instituted a program to screen all personnel for sleep disorders and ensure they received treatment and monitoring (Bello, 2008).

The authors of one retrospective study regarding sleep disorders in unexplained motor vehicle crashes pointed out that the medical field in general has ignored the potential risk that undiagnosed sleep disorders may pose. While conducting their research, the team was unable to find any trauma centers that referred operators in these collisions for follow up to rule out sleep disorders as a contributing factor. These screenings would merely be reactive, but may diminish the potential for further crashes involving the same operators (Fuchs et al., 2001).

One of the few agencies in the United States which has proactively sought to decrease the effects of sleep deprivation and fatigue on their employees is Austin-Travis County Emergency

Medical Services (Texas). Austin-Travis County brought in an outside consultant, studied staff activities at work and when off duty, and developed a scheduling system that met the needs of their responders while improving the quantity and quality of their sleep. Their solution focused exclusively on modifying the duration of and rotation of shifts and their agency does not routinely provide the long-distance transfers that are the focus of this research (McCallion, 2012).

The literature review process revealed findings from studies involving the use of naps in the workplace setting that were not considered when this project was initiated. Research has been conducted on sleep deprivation and fatigue and the effects of these forces on emergency providers for decades, but there has been precious little change in the industry, particularly when the focus is narrowed to the scope of this project which precludes altering the length of shifts worked.

Procedures

This project started with an extensive literature review. While on campus at the National Fire Academy for the classroom portion of Executive Development, the resources of the Learning Resource Center were utilized to obtain several documents that were not available digitally over the internet. Multiple documents were culled from the internet via search engines and intermittent review of industry-related publications that went to print in the intervening time period added to the body of knowledge.

After completing the bulk of the literature review, a series of questions were formulated in order to conduct interviews with both neighboring ambulance providers and providers from other regions of the contiguous United States with similar responsibility for long-distance interfacility transfers and staffing consisting of shifts of twenty-four or more hours in length. A

separate set of questions was developed for interviews with the transport coordinators of the two hospitals in the area along the Colorado River in central western Arizona where the author's fire district is located. The interview questions are listed in appendices A and B.

An Executive Development classmate provided a reference to an agency in Kansas with work schedules and transfer distances comparable to those at Fort Mojave Mesa. At the conclusion of the Kansas interviews, a referral to other suitable agencies was sought. A post was placed on the International Association of Fire Chiefs' KnowledgeNet Open Forum. One response advised of an agency in Michigan that might fit this project's criteria. An email was sent to the Chief of the department with no response. The author of a PowerPoint presentation on sleep deprivation and fatigue discovered while conducting searches for the literature review (Chief Tan, New Castle County Emergency Medical Services (Delaware)) was contacted to inquire about other potential individuals to interview. Chief Tan was unaware of any agencies employing any strategies or policies other than the extensive changes to shift length and rotation undertaken by Austin-Travis County Emergency Medical Services (mentioned in literature review).

Interviews with neighboring ambulance agency representatives were conducted face-to-face. Interviews in Kansas were conducted via telephone. The individuals interviewed from the State of Kansas did not have neighboring, mutual aid ambulance services interested in taking out-of-town transfers, so the final interview question was not applicable. Several attempts to schedule face-to-face or telephone interviews with the Emergency Department Director at Valley View Medical Center in Fort Mohave, Arizona were unsuccessful. The author eventually was forced to resort to agreeing to an email response. All attempts, including email, to interview the Emergency Department Director at Western Arizona Regional Medical Center in Bullhead City,

Arizona were unsuccessful. Since transports out of that facility are infrequent, their participation or, in this instance, lack thereof will have virtually no impact on the research outcome or any future efforts to address the findings of this research, but correlating those responses with the responses from Valley View would have reinforced certain presumptions.

The pool of interviewees for this project ultimately ended up being significantly smaller than anticipated at the onset of the research. While there are undoubtedly multiple other regions across the country with similar circumstances to those that inspired this project at Fort Mojave Mesa, the author was unable to uncover any evidence through search of digital media, networking, and telephone conversations that an agency exists that has made a significant effort to address the topic with any approach other than the aforementioned modification of shift length and rotation.

Results

A face-to-face interview was conducted with Division Chief Steve Duncan of the Bullhead City Fire Department on July 10th, 2012. Chief Duncan stated that his department attempts to use on-call (off-duty) personnel to staff out-of-town transports. If no on-call personnel are available, then an on-duty crew will be assigned. Bullhead City Fire personnel work a forty-eight hour shift with ninety-six hours off in between shifts. The only difference between the Bullhead City shifts and the Fort Mojave Mesa shifts is that they are off by one day (For example, Bullhead City Fire "A" shift personnel start on a Monday while Fort Mojave Mesa "C" shift is working. On Tuesday, Fort Mojave Mesa "A" Shift begins their tour, Bullhead City "A" shift remains on duty. On Wednesday, Bullhead City "B" shift relieves "A" shift while "A" shift remains on duty at Fort Mojave Mesa.). Crews are only allowed to perform one transfer after 23:00 hours. If a crew returns from a run out of town at 01:00 and another request is

received, a different crew will be placed into service or the request will be declined. Chief Duncan agreed that sleep deprivation and/or fatigue are a serious risk to the safety of crews performing late-night interfacility transfers. Bullhead City Fire crews are allowed to check into a hotel and sleep before returning after they have transferred patient care to the receiving facility if neither crew member feels that they can safely operate the ambulance for the return trip. Chief Duncan iterated that if the transferring facility does not accept the fire department request to delay transfer until shift change, they will "shop" for an alternative ambulance agency. Chief Duncan affirmed that Bullhead City Fire Department would cooperate with efforts to institute a policy of delaying transports in the interest of mitigating the effects of fatigue.

A face-to-face interview with Assistant Chief Robert Kemp of the Mohave Valley Fire Department was conducted on July 18th, 2012. Mohave Valley, like Bullhead City and Fort Mojave Mesa, attempts to assign off-duty personnel to staff out-of-town transports whenever possible. Due to the absence of a hospital within the Mohave Valley Fire District service area, Mohave Valley ambulances perform fewer interfacility transfers than either of the other two departments and on-duty crews are utilized far less frequently. Mohave Valley company and chief officers monitor crew workload during the day and make a determination regarding the perceived fatigue level of their personnel. If either the chief officer or the company officer feel the transfer would jeopardize personnel safety, the department will refuse the transport. Distance of the transfer is a factor in the decision-making process. Chief Kemp felt that he would categorize the risk of late-night interfacility transfers as "moderate." He stated that department officers attempt to avoid unnecessary risk through the use of the previously mentioned discretion based on their perception of crew fatigue levels. Mohave Valley does not have any written policies to address sleep deprivation or fatigue. Chief Kemp also confirmed that his department

would support any efforts by mutual aid departments to institute policies allowing crew rest prior to initiating a transfer.

A telephone interview was conducted with John Ralston of Seward County Emergency Medical Services (Kansas) on July 17th, 2012. Mr. Ralston reported that his personnel work twenty-four hour shifts (and are on-call for the twenty-four hours prior to their assigned shift). Seward County uses overtime crews who are not on-call when possible due to the fact that personnel who are up a significant portion of the night before reporting for their normal duty shift would start their shift with increased stress and fatigue. If they are unable to rest after reporting for duty, the sleep deprivation and fatigue increases the risk for serious error. Mr. Ralston categorized sleep deprivation and/or fatigue as a serious risk to the safety of crews performing long-distance transfers late at night. If no on-call or overtime crews are available to take a transfer, Seward County works with the hospital in their service area to delay the transfer until change of shift and the off-going crew will take the assignment. Mr. Ralston stated "doctors do not like to be told they can't do something" (J. Ralston, personal communication, July 17, 2012), but he acknowledged that when there is no other ambulance available, they have no choice but to begrudgingly work with them to make arrangements for the following morning.

A telephone interview was conducted with Captain Michael Brown of Ford County Fire / Emergency Medical Services (Kansas) on July 18th, 2012. Ford County fire personnel work twenty-four hour shifts. Captain Brown's main concern with late-night interfacility transfers was that it affected his personnel's performance at their secondary places of employment. Many Ford County Fire responders work for ambulance services in neighboring jurisdictions on their days off and sleep deprivation and fatigue affect their ability to perform at those jobs the following day. Captain Brown called late-night interfacility transfers a "safety hazard" (M.

Brown, personal communication, July 18, 2012) and agreed that they represented a serious risk to safety. After 23:00, the local hospital attempts to fly any patients that must be transferred. If a patient cannot be flown and the hospital insists that they cannot delay transfer until the next morning, Ford County will fulfill the request, but this is an infrequent occurrence.

An email response from Tracy Osborne of Valley View Medical Center was received on July 24th, 2012. Ms. Osborne indicated that she did not have any knowledge of the work schedule of ambulance crews performing transfers for her facility. Ms. Osborne stated that she believed ambulance crew sleep deprivation and/or fatigue could lead to serious medical errors and/or driving accidents. Ms. Osborne expressed her opinion that the risk involved in interfacility transfers was outside her purview and should be addressed by ambulance agency management. In response to the question regarding delay of transport to allow crews the opportunity to nap, Ms. Osborne responded:

> There are very few transports that you can say that there would be no deterioration in condition and justify delay of transportation to a facility with the ability to care for the patient. I believe this would constitute a delay in care and would leave the hospital liable for malpractice lawsuits (T. Osborne, personal communication, July 24, 2012).

In response to the final question regarding support for a policy to delay transfers long enough to allow crews an opportunity to nap, Ms. Osborne responded in a fashion similar to the previous question citing hospital liability for delays and adding that delaying transfer requests had the potential to push the hospital to a critical volume / acuity overload situation with patients being held in the emergency department.

There should be no debate about the fact that there is risk associated with late-night out-of-town transfers. What level of risk is acceptable depends on who is assessing the risk. The

risk is deemed significantly higher from the ambulance provider perspective than from the transferring facility perspective, but it is reasonable to presume that a substantial portion of those coordinating interfacility transfers have a knowledge of ambulance organization operations comparable to Ms. Osborne. All three of the local agencies considered in this research use similar strategies to attempt to bring in personnel who they believe to be rested to staff out-of-town transfers. No information was uncovered to indicate that successful methods have been implemented at similar agencies elsewhere in the United States.

Discussion

All of the individuals interviewed, both from ambulance organizations and hospital facilities, agreed that there is a significant risk involved in the performance of late-night, out-of-town, interfacility transfers. This is in concurrence with Motohashi and Takano's findings from two decades ago. One does not have to be employed in emergency services to grasp the increased element of risk involved when operating any motor vehicle between sunset and sunrise. Operations from midnight to sunrise have the added burden of being in conflict with natural sleep cycles and placing operators on the road during hours when intoxicated drivers are more likely to be concurrently using the roadways. Much more extensive research and innovation has occurred in the commercial highway transportation industry (Bello, 2008) where government regulation and a substantially higher number of miles driven are forces for change. The highway transportation industry has progressively moved in the direction of regulation similar to that already established (and incrementally tightened over time) in the air and rail industries.

Although exhaustive searches of the available research on the subject, inquiry through industry contacts, and the interviews conducted for this research could produce no examples of

the application of techniques to mitigate the effects of sleep deprivation and fatigue in the ambulance industry, efforts from the highway transportation industry (Bello, 2008) and medical industry (Driskell & Mullen, 2005) could easily be instituted in situations which are not 911-originated.

In contrast to the trucking industry, when an ambulance needs to make a pickup, the stakes are usually higher. Merely stating "it's your job" and "take care of the patient / public," however, is not sufficient. As case law in this country increasingly places emergency services providers and their managers in legal peril, Fort Mojave Mesa and the industry in general can ill afford to brush off implications of policies or procedures that involve unmitigated risk. The emergency services profession does have inherent risk, but the industry is constantly refining protective gear and revising tactics in attempts to reduce the risk faced on a daily basis. Practices like "two in-two out" have become fairly accepted national standards in spite of the fact that they may cause a delay in our ability to take the actions citizens expect from us. The air medical industry has made crew resource management and the concept of cancelling a mission if any one crew member feels unsafe core values. It may only take one lawsuit to bring sweeping changes to the ambulance industry.

Recommendations

Further research needs to be done on the efficacy of implementing mitigation techniques from other industries in emergency services. Even in the absence of such research, I believe Fort Mojave Mesa and other ambulance providers operating under similar circumstances would be remiss should they fail to seriously consider trial enactment of a forty-minute nap period prior to initiating late-night transfers if the assigned crew has not been asleep for a minimum of two hours prior to the request.

Much discussion is occurring in the fire service industry today regarding health and wellness programs. Fort Mojave Mesa has a fairly robust health and wellness program for emergency response personnel. The department should investigate adding sleep disorders to the program. This step could not only have an impact on sleep deprivation and fatigue for ambulance transfers and other duties while on the job, but could dramatically improve the health and quality of life for employees with undiagnosed sleep disorders.

One no-cost measure that could be implemented immediately is education and communication with the transferring facilities. Health care providers and health care institutions have a vested interest in ensuring the safety of their patients. Health care institutions are also litigation-phobic and would likely be extremely reluctant to oppose reasonable measures that are proposed to them as potentially risk-reducing and, therefore, liability-reducing processes. These discussions should probably occur with the facility's chief executive officer, chief financial officer, attorney, or other high-ranking member of management. Clinical staff involved in scheduling ambulance transfers are likely to be more focused on the immediate needs of the hospital and less likely to be able to grasp the far-reaching implications of a patient being injured or killed in-transit to another facility from their hospital.

Finally, while conducting this research, the author learned of two types of emerging technological applications that may provide protection in the future. The first of these technologies is a drowsy driver alert system. The system involves a camera or cameras mounted in front of the driver that monitor for signs of drowsiness. Most of the current systems sense the percentage of eye closure (PERCLOS) and provide a warning when certain parameters are met which may indicate drowsiness. In order to silence the alarm, the driver must push a button. This system, therefore, may increase driver alertness due to the audible alarm and the movement

required to reach the button to silence the alarm. Installation of similar systems in production vehicles is likely only a few years away. There are systems on the market at the time of this writing that can be retrofitted into commercial vehicles. At present, cost may be a limiting factor in adopting this technology.

The second technological application encountered is computerized cognitive testing. At least one company offers an internet-based solution specifically designed to determine the competency of commercial drivers before they begin driving. For ambulance agency purposes, the assigned crew could be required to sit down at a computer for approximately ten minutes upon notification of a transfer. If not cost prohibitive, this solution could be quickly instituted with no hardware required. One obstacle would be creating a policy that would deter personnel from intentionally performing poorly in order to avoid an assignment and yet not have a significant negative impact on morale. Such a policy would likely have to require an employee to be sent home on sick leave were they to fail the cognitive examination.

Fort Mojave Mesa labor and management should place a high priority on evaluating potential mitigation measures as soon as possible. The department should investigate the viability of implementing one or both of the currently available technological solutions. Moving forward, responders and managers would be well-advised to keep abreast of changes in both recommendations and technological advances in the field of sleep deprivation to ensure that the risk of injury and damage to property is controlled to the extent feasible.

References

Bello, D. (2008, January). Working and driving 24/7: Does your company understand the dangers and effects of sleep deprivation? *Safety+Health*, 42-45.

Dernocoeur, K. (2000, November). Asleep at the wheel. *EMS*, 32.

Driskell, J. E., & Mullen, B. (2005, Summer). The efficacy of naps as a fatigue countermeasure: A meta-analytic integration. *Human Factors, 47,* 360-377. Retrieved from http://floridamaxima.com

Erich, J. (2011, February 8). Dead tired. *EMS World*. Retrieved from http://www.emsworld.com

Executive development student manual [Student Manual]. (2011, December). Emmitsburg, MD: Federal Emergency Management Agency.

Faverty v. McDonald's Restaurants of Oregon, Inc., 892 P.2d 703 (Or. Ct. App. 1995).

Frank, A. J. (2004, February 1). Fatigue management. *EMS World*. Retrieved from http://www.emsworld.com

Fuchs, B. D., McMaster, J., Smull, G., Getsy, J., Chang, B., & Kozar, R. A. (2001, November). Underappreciation of sleep disorders as a cause of motor vehicle crashes. *American Journal of Emergency Medicine*, *19*, 575-578.

McCallion, T. (2012, April). Mitigate the dangers of shift work: What EMS can learn from case studies. *EMS Insider*, *39*(4), 1, 7-9. Retrieved from www.emsinsiderdigital.com

Motohashi, Y. (1992). Alteration of circadian rhythm in shift-working ambulance personnel, monitoring of salivary cortisol rhythm. *Ergonomics*, *35*, 1331-1340.

Motohashi, Y., & Takano, T. (1993, June 29). Effects of 24-hour shift work with nighttime napping on circadian rhythm characteristics in ambulance personnel. *Chronobiology International*, *10*, 461-470.

Nugent, T. (2007, March). Around the clock: The effect of night shifts on your health & safety. *Journal of Emergency Medical Services, 32*(3). Retrieved from http://www.jems.com

Smith-Coggins, R., Howard, S. K., Mac, D. T., Wang, C., Kwan, S., Rosekind, M. R.,...Gaba, D. M. (2006, May 1). Improving alertness and performance in emergency department physicians and nurses: The use of planned naps. *Annals of Emergency Medicine, 48*, 596-604. doi:10.1016/j.annemergmed.2006.02.005

Strategic plan: Fiscal years 2010-2014 [Strategic Plan]. (n.d.). Retrieved from United States Fire Administration website: http://www.usfa.fema.gov

Zagaroli, L., & Taylor, A. (2003, January 27). Ambulance driver fatigue a danger: Distractions pose risk to patients, EMTs, traffic. *Detroit News*. Retrieved from http://nl.newsbank.com

Appendix A

EMS Agency Questions

1. Do employees performing late-night interfacility transports work shifts exceeding 16 hours in length?

2. How do sleep deprivation and/or fatigue affect staff members who conduct late-night interfacility ambulance transports?

3. Would you classify sleep deprivation and/or fatigue as a serious risk to the safety of the crews performing these transports?

4. Do you have any policies and/or procedures in place to reduce or avoid unnecessary fatigue when providing late-night interfacility ambulance transports? If so, what are those policies and/or procedures? If those policies include delaying transports during certain hours of the day, during what hours of the day does it apply? How did the transferring facility(ies) respond when the policy was implemented? What challenges have you faced in implementing/maintaining the policy?

5. If a neighboring agency instituted a policy of delaying transports during certain hours in order to allow the assigned crew an opportunity to nap prior to the transport, would your agency be willing to honor such a policy?

Appendix B

Hospital Transport Coordinator Questions

1. Do you know the length of the shifts worked by the personnel who staff the ambulances performing your late-night interfacility transfers?
2. In your opinion, how might sleep deprivation and/or fatigue affect the ambulance crew?
3. Would you classify sleep deprivation and/or fatigue as a serious risk to the safety of the patients you send on these transports?
4. If your ambulance agency instituted a policy delaying non-life-threatening transports originating between midnight and 08:00 to allow crews the opportunity to nap prior to transport, how would this affect your operations?
5. Would your facility support such a policy?